International Migration and Household Agricultural Production Decisions: The Case of El Salvador

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Introduction

Inequitable distribution of productive assets has long been a major issue in El Salvador. Specifically in the agricultural sector, land has historically been held primarily by large land owners, who draw on a large rural landless population for farm labor. These large land holders primarily produce coffee, cotton, and sugar and provided the backbone of the agricultural export sector. The distribution of rural assets, primarily land, was one of the contributing factors to the twelve year Salvadoran civil war. As a result of the violence from this civil conflict, throughout the 1980s people migrated out of rural El Salvador in large numbers.

The civil war was a violent demand for structural change in the Salvadoran economy. However, arguably the most lasting change the civil war brought to the Salvadoran economy was a legacy of migration and a system of migrant networks that now exist and facilitate the current migration patterns. The exodus of people from El Salvador, and the resulting flow of remittances, has been a major driver of economic and social change in the past 20 years.

Between 1980 and 2001, the area of agricultural land cultivated increased by 6 percent, however the population in El Salvador increased by 42 percent. This increasing scarcity of productive agricultural land has led many rural families to pursue migration and remittances as an increasingly common livelihood strategy. In this paper we investigate how migration and remittances have changed the rural sector, focusing on asset accumulation and the use of these assets. Specifically, the research questions addressed are:

1. Do migration and remittances change the land holdings of migrant sending households?
2. Do migration and remittances change the land use patterns of households?
3. Do migration and remittances increase investment in agricultural assets such as cattle and land?

A Brief History of Agriculture in El Salvador

In 1839, at the time of independence from both Spain and the Central American Federation, El Salvador was not afflicted with the same latifundio-minifundio land and political system[1] that led to massive concentration of land and political power among elites in neighboring countries. This situation changed in the 1880s when all national, or communal indigenous lands, were expropriated and turned into latifundios. The abolition of common lands in 1882 left private ownership as the only form of land tenure. Expropriated land was primarily used for cash crops such as coffee, cotton, and sugar throughout the first half of the 1900s (Vargas, 2003). During the expansion of the agricultural frontier to increase the production of cash crops on latifundios, land used for subsistence agriculture by the rural poor was often overtaken, increasing the concentration of wealth and land into the hands of relatively few elite.

During the 1960s, after a minor and failed attempt at agrarian reform to distribute large land holdings in the 1930s, a second agrarian reform was implemented. This reform also failed to break up large land holdings and benefited only a few landless farmers. However, the stakes in this agrarian reform were elevated by the massive

[1] The "latifundio-minifundio system" is a land tenure system that is comprised of large commercial land holdings alongside of small plots primarily farmed by indigenous or peasant farmers. Latifundios are the large commercial plots of land and minifundios are small subsistence plots.

immigration of refugees returning after the 1969 war with Honduras, increasing the demand for available farmland. Concurrently, the expansion of cattle grazing and cotton production led to widespread peasant evictions during the early 1970s. Further, the military rule that regarded social order by repression as a priority over land reform stoked tensions between the rural landless and the landed elite who had impressive political power and close ties to the military government.

The political tension over land in El Salvador boiled over into a civil war in 1980, concurrently with a new round of attempted land reform backed by the reform-minded military government which overtook power by coup in 1979. This reform included three phases, of which only Phase I and Phase III were implemented. In Phase I farms larger than 500 hectares were expropriated. Owners were allowed to retain 100-150 hectares and the rest was to be farmed by a production cooperative. Phase III required that land be titled to the tiller, and as such land tenants and sharecroppers could file claims to be owners of their plots. These reforms were unsuccessful at quelling conflict and also unsuccessful in bringing about meaningful change in land distribution and land security in El Salvador.

In 1992, the Chapultepec Peace Accords officially ended the civil war; however these peace accords did little to abate the out-migration of people from El Salvador primarily to the United States. Data from the United States' Public Use Micro Sample indicates that Salvadorans in the United States are predominantly from poor and rural communities. In the 1990s, a World Bank survey indicated that on average 40 percent of farming families, and 34 percent of rural families had at least one migrant (Grammage, 2006).

The underlying reasons of rural out-migration are a complicated nexus of decreasing global commodity prices, increasing underemployment in the agricultural sector, decreasing real agricultural wages, the need to compensate for missing or inadequate credit and insurance markets, and the prospect of a higher expected wage in the destination labor market.

Literature Review

While explanations of migration have existed historically in the economics literature, the explicit exploration of migration's role in economic development was introduced by Todaro (1969) and Harris and Todaro (1970). Classic economic development theory considers labor migration out of agriculture to be a key component in economic development both historically in industrialized countries, and currently in developing countries (Bardhan and Udry, 1999). It assumes that development requires the spatial transformation of society, from a dispersed rural sector to concentrated urban sectors in order to provide labor for an industrialized economy (Bardhan and Udry, 1999). The Harris-Todaro (HT) model assumes that potential migrants compare the expected utility of migrating with the expected utility of remaining in the countryside in determining their migration decision (Todaro, 1969; Harris and Todaro, 1970).

The HT model is a two sector (urban and rural) model in which rural to urban labor migration is a result of expected income differences between the two sectors. Since the introduction of the HT model, many extensions have been developed to account for inter-sectoral labor migration (Amano, 1983), inter-sectoral capital mobility (Neary, 1981), endogenously determined urban wage rates (Calvo, 1978 and Stiglitz, 1974), and

welfare implications of the HT model (Bhagwati and Srinivasan, 1974, 1975; Corden, 1974). While many of the underlying assumptions in this model are still widely accepted, it is also recognized that the migration process is not nearly as clean as would be required for this model. Specifically, a major assumption of the HT model is that migrants maximize their individual utility by migrating to the labor market with the highest expected value of income. However, in the early 1980s a strand of literature, referred to as the New Economics of Labor Migration (NELM) was pioneered by Oded Stark (1991)[2] and Stark and Bloom (1985) and addressed the assumption of migration being an individualistic decision process. The NELM model considers the migration decision to be a joint decision between the migrant and the family.

The NELM was an attempt to move the economics profession away from the collective perception that labor migration was solely a response to spatial differences in expected income as proposed by the HT model. Stark developed this new theory based on three main premises.

First, he suggested that migration was not a result of individual optimizing behavior, but rather the rational behavior of a group, such as a family. Given the collective optimization of household welfare, consequences of migration such as remittances were calculated in the migration decision, not simply accidental byproducts. The NELM also contests standard human capital theory which posits that the performance of migrants in the destination labor market is an outcome of skill levels and endowments. The NELM suggests that the preferences and constraints of the sending household are important factors in the determination of destination labor market

[2] This reference is to a book by Oded Stark printed in 1991, which is based on the NELM strand of literature he pioneered in the early 1980s.

performance. Given that the decision to migrate is a family decision, a cooperative arrangement must be made for migration and remitting to take place, therefore familial considerations of "intra-familial trade in risk, coinsurance arrangements, devices to handle principal agent problems, moral hazard problems, and contract enforcement" all influence the migrant's performance in the destination labor market (Stark, 1991).

Second, Stark contends that migration is not simply a response to labor market wage differentials. Rather, he suggests, people assess their relative wealth within a given reference group and are induced to migrate if they are relatively worse off than their peers. This theory, known as the relative deprivation theory, implies that relative deprivation and income uncertainty will be important factors in the decision to migrate (Stark 1984, Stark & Taylor 1991, Stark 1991). Stark and Taylor (1991 & 1989) test the relative deprivation hypothesis in the case of Mexico, and find supporting evidence that relative deprivation is a significant explanatory factor in international migration between Mexico and the U.S..

Third, the NELM posits that migration is a function of missing (or undeveloped) markets in a given area. One of the consequences of missing markets in developing countries is that rural households cannot access markets that would allow them to invest, diversify, and benefit from the processes of industrialization, and thus must migrate to capture these benefits[3].

The impact of remittances on agricultural production is a relatively new topic of research in the migration and remittance literature and generally uses the NELM as a theoretical basis. Taylor and Wyatt (1996) study the effectiveness of remittances in

[3] For example, a rural family in the United States has access to benefits of the industrialization process through the stock market. In rural areas in most developing countries this type of mechanism does not exist (Stark, 1991).

relieving credit and risk constraints in the farm-household economy in Mexico. They find that the effect of remittances depends on the farm-household's initial asset holdings and that initial production constraints are important in determining the impact on rural income inequality. They find that remittances have an important positive impact on farm income when assets are relatively illiquid. For example, when households had non-marketable national land for production, the remittance-income effect was positive because this land requires high complementary investments (labor, capital, fertilizer) and these households were more likely to be credit constrained because they could not use national land for collateral. However, livestock is relatively liquid and depends on few complementary investments, and as a result their income-remittance effect was negative.

Rural asset holdings are a key consideration when examining the impact of remittances on rural households. Adams (1998) makes a contribution in understanding the relationship between rural asset accumulation and remittances in the context of Pakistan. This study reveals that remittances increase the marginal propensity to invest for migrant sending households. He shows that remittance income – especially from abroad – is seen as transitory rather than permanent income, and is thus more likely to be invested rather than consumed. In this study he focuses primarily on investment in land and livestock, however the study does not go so far as to investigate the resulting productivity of accumulated assets, it remains focused on the accumulation of such assets resulting from remittances.

Rozelle and others (1999) address the question of farm productivity responses to remittances in the case of China using cross-sectional data for 1995. They find that migration significantly decreases corn yields, and attribute this decrease to an absence of

on-farm labor markets in this area of China. They find that reduced yields from loss of labor are partly mitigated by the increased access to capital facilitated by migrant remittances. Remittances in China were determined to loosen constraints on crop production and stimulate productivity.

Several recent working papers (McCarthy et al, 2006; Miluka et al., 2007) have provided guidance in determining explicit relationship between remittances and agricultural production both using data from Albania. McCarthy et al. (2006) find that permanent international migration has a negative impact on staple cereal production and land allocated to fruits, but a positive sign on land allocated to forest and pasture, as well as a positive impact on livestock holdings. Miluka et al. (2007), find that migration is primarily used as a strategy for households to pull out of crop agriculture. They similarly find that remittance-receiving households do not invest in productivity-enhancing and time-saving farm technologies in crop production and that they shift their agricultural investments from crop production to livestock production.

In this paper we primarily make an empirical contribution to this literature by examining specific changes in both asset accumulation and asset use induced by international migration and remittances. Further, this study addresses several empirical concerns present in the previous studies resulting from their use of cross-sectional data, by using a panel household dataset that follows 451 households over six years. This data allows us to control for household-specific effects that likely influence household behavior, and to more thoroughly examine the influence of migration and remittances on household behavior over time.

Overview of Agriculture and Migration in El Salvador

Remittances from migrants have increased dramatically since the Peace Accords were signed in 1992. Salvadorans living abroad sent $US858 million in remittances to El Salvador in 1992[4]. This number has steadily increased over the past 16 years, and in 2006 El Salvador received $US3.1 billion in remittances. Table 1 documents the remittance levels and growth of remittances between 1991 and 2006. Over this time remittances have increased by 258 percent.

The GDP shares for remittances, agriculture, and industry are presented in figure 1. In 2005, remittances accounted for approximately 17 percent of the GDP in El Salvador. This share of the GDP has remained fairly stable over the past 15 years; however, it has grown significantly relative to agriculture's share of GDP. In 1998, remittances overtook agriculture as a share of GDP. While agriculture is decreasing as a relative share of the Salvadoran economy the rural economy remains an important determinant of welfare in El Salvador given that 39.9 percent of the population in 2006 lived in rural areas.

Figure 2 shows the geographic concentration of households that receive remittances. This figure shows that the eastern and northern areas of El Salvador are the most likely to receive remittances, which closely coincides with the areas of the country that were hardest hit by violence in the civil conflict.

The value of El Salvador's primary cash crops has decreased in relative importance in the economy. While beans, maize, and sugar all exhibit diminishing relative shares in the GDP, the share of the value of coffee produced has decreased the

[4] These remittance figures are a lower bound, since a significant proportion of remittance flows occur through informal channels and such remittances are never accounted for.

most dramatically between 1991 and 2003, due to both a drop in production (150,000 tons to 88,000 tons) and a drop in coffee prices (from $US1049 per ton to $US413 in 1991 prices). Figure 3 demonstrates the shares of individual crops to the GDP between 1991 to 2003.

The percent of employment in agriculture has also fallen. Between 1994 and 2004 the percent of female employment in agriculture fell from 8.3 to 3.4 percent and the percent of male employment in agriculture fell from 40 to 30 percent. See figure 4 for a graphical demonstration of this trend.

It is clear that traditional agriculture is on the decline in El Salvador. However, it is unclear how remittances interact with this dynamic environment. Do remittances help people invest in agricultural assets and increase on-farm productivity? Or do they facilitate a family's move out of agriculture by enabling investment in a growing non-farm rural environment?

Theoretical and Empirical Considerations

It is well accepted that agricultural production in any environment is an inherently risky activity as a result of a complex interaction of unalterable factors, such as weather, soil quality, climate, etc. In a well functioning, integrated rural economy, insurance markets help to mitigate this risk and credit market foster investment. However, in many rural areas in developing countries these markets are imperfect or do not exist. Remittances and migration, according to the NELM substitute for these markets. The migration of a household member is one way to spread risk spatially and distribute risk among household members.

Once a household engages in migration and receives remittances, the impact of these remittances is ambiguous. Remittances have a positive income effect, and may foster investment into productive assets, and thus increase agricultural production. However, at the same time, the risk mitigation strategy of migration alters the household's labor endowment. If one assumes that rural labor markets function perfectly, a household should be able to hire labor to substitute for this loss of labor. However, if labor markets are imperfect, or if the migrant has some location specific knowledge such as appropriate production practices for soil type and quality on that specific farm, rural labor markets may not be adequate to compensate for this loss.

The relationship between migration, remittances, and remittance-receiving household outcomes is complicated by a number of considerations discussed here. Firstly, it is likely that a farm household's asset holdings before migration, influence the household's ability to undertake migration. As such, it may be difficult to determine if a household's asset levels are influenced by migration, or if migration is an outcome of a household's asset levels. This implies empirically that reverse causality, especially with regard to household asset levels will likely lead to endogeneity. Secondly, it is consistent with both theoretical and anecdotal evidence that the household makes the decision to migrate as well as the use of remittances collectively before migration takes place.

Further, as Taylor and Wyatt (1996) point out, remittances do not have any agricultural production effects in the same time period as they do not influence the first order conditions or the household-farm profit maximization problem. However, they may influence investment over time, as well as a household's perceptions of risk, and

may therefore have production side impacts. Using this justification, and the fact that our data extends over 6 years, a number of production related variables are explained.

As a result of the potential endogeneity of remittances, and two-stage instrumental variable approach is used. The identification of appropriate and effective instrumental variables is a major challenge found throughout the migration and remittance literature. For this analysis a number of household as well as state level variables are use. First, the household's previous migration patterns are used, namely the number of migrants a household had abroad. It is likely that the larger the family migrant network, the more likely the family is to receive remittances. The second household variable is the distance between the household and the capitol in minutes. If a household is farther from the capitol, they are possibly more dependent on remittances for transport to services and other basic necessities. Thirdly, we use departmental dummy variables as instruments given the concentration of the civil war and the patterns of migration these concentrations created. Fourth, at the state level, we use public investment, assuming that remittances may substitute for public investment, and lastly we use the percentage of households that receive remittances, assuming that the community may have a culture of remittances that influences remittance flows.

Empirical Model

The migration decision is made by the household to minimize risk and substitute for missing credit and insurance markets. Remittances are therefore, not exogenous income shocks, but rather a livelihood strategy agreed upon by household members located at different spatial points (Acosta, 2006). Given that migration is a livelihood

strategy choice for households, it is reasonable to assume that these households are deciding their migration and remittance strategy jointly with other income earning and agricultural production activities. Endogeneity between agricultural outcomes, migration, and remittances is addressed using an instrumental variable approach for panel data. Also, given that panel data is employed, a random effects model is specified to account for household level unobserved effects through a household specific error term[5].

The equation of interest is:

$$A_{it} = X_{it}\gamma_1 + \gamma_2 \hat{R}_{it} + \varepsilon_{it} + u_i \qquad (1)$$

where A_{it} is a measure of a given agricultural outcome, X_{it} is a vector of household demographic variables, $\hat{\mathbf{R}}_{it}$ is the predicted level of remittances a household receives and ε_{it} and u_i are the combined household specific and aggregate error terms.

Remittances flow from migrants and are endogenous in this equation. The remittance equation is identified using a set exogenous variables that are correlated with remittances but have no effect on agricultural outcomes beyond their effect via remittances. The instruments used in this equation are (1) the level of public investment in the community, (2) departmental dummy variables, (3) the number of migrants that a household has abroad, (4) minutes that a household is from the capitol and (5) the percentage of households that receive remittances at the municipal level. The structural equation given for remittances is:

$$R_{it} = Z_{it}\alpha_1 + \alpha_2 \boldsymbol{X}_{it} + \varepsilon_{it} + u_i \qquad (2)$$

[5] Each specification was run using OLS, IV-OLS, random effects, and fixed effects. Using a Hausman test, the random effects model was determined to be adequate. Both the OLS and the IV-random effects results are presented.

where Z_{it} is a identifying set of exogenous variables listed above that determine the level of remittances and $\boldsymbol{X}_{it}$ is set of demographic characteristics used in (1). This approach including the same set of explanatory variables is used to estimate all results presented in the results section.

To examine the response of agricultural outputs to remittances, agricultural assets, agricultural production value, land use areas, and cropping areas were all used as dependent variables. Explanatory variables used in these models are informed by the NELM and other agricultural models surveyed. As such, agricultural outputs are explained by predicted remittance levels, land area, off-farm wage, the value of livestock, and a set of demographic control variables. Several variables, discussed above, are included in Z_{it} in the first stage as instruments to identify the system and address the endogeneity problems inherent in R_{it} in the labor supply equation. All variables used in the empirical analysis, and their definitions, are found in Table 2.

Data

The data used for the empirical analysis in this paper is a four year panel data set collected in El Salvador in 1996, 1998, 2000, and 2002. The Salvadoran Foundation for Economic and Social Development[6] (FUSADES) along with the World Bank collected the first National Rural Household Survey in 1996. The second and third rounds were implemented by FUSADES in cooperation with the Rural Finance Program at The Ohio State University (OSU) under the Broadening Access and Strengthening Input Markets System (BASIS) program in El Salvador. After the completion of the BASIS program,

[6] In Spanish: *Fundación Salvadoreña para el Desarrollo Económico y Social*

OSU and FUSADES conducted a fourth round of data collection in 2002 to complete the four year panel (Pleitez-Chavez, 2004).

The 1996 survey was designed as a stratified random sample that is representative of all rural areas in El Salvador. The initial sampling plan was based on the 1992 labor force census, which called for 192 land using[7] households and 436 rural worker households, constituting a stratified sample of 628 households. However, to allow for more precise analysis on agricultural production activities an additional 110 land using households were added. Thus, the total sample size for the 1996 survey was 738 households. These households represent all departments (states) in El Salvador. The questionnaire design was based on the World Bank's Living Standards Measurement Study (LSMS) surveys with detailed modules on education, health, occupation, assets, income generating activities, credit transactions, land transactions, agricultural production activities, household labor allocation, hired labor, and migration and remittances.

The 1998 sample resurveyed 494 households from the original primary sample of 628. Thus, the attrition rate between 1996 and 1998 was 24 percent. Originally the survey team intended to interview all 628 households, but it was only able to re-interview 469.

The panel was supplemented by re-interviewing 25 of the additional land using households added to the first round of the panel (Conning et al, 2001). Given that the 1996 panel was stratified by departments, the 25 replacement households were chosen from residents of the same department as those households they were replacing (Pleitez-Chavez, 2004). In 2000, the households were again re-interviewed. In the 2000 round

[7] Land using households were defined as households employing more than 0.5 manzanas of land

469 households were located and interviewed. This process was undertaken again in 2002, at which time 451 households were located. This resulted in a panel that includes information on 451 households for all four years with a cumulative attrition rate of 28 percent between 1996 and 2002.

Attrition in the panel

Given the attrition rate in the panel, this section investigates if attrition from the panel was random. Table 3 presents a series of probit estimates to investigate if there are any non-random characteristics of attritors. This table provides an attrition probit for the total attrition over the four year panel as well as an attrition probit between 1996 and 1998, 1998 and 2000, as well as between 2000 and 2002. Results from these models suggest that larger households are more likely to remain in the panel over the eight year time frame, while households with children and those in the department of Cuscatlan are less likely to remain in the panel. Individual year results largely support the overall results, except for the result in the 2000 to 2002 model that suggests that female headed households are more likely to stay in the sample between these years.

Descriptive Statistics

In this section we provide a description of the data used in the empirical analysis. Variables in table 4 are described by migrant and non-migrant household means and the total sample means and provided as well. A simple t-test is conducted between non-migrant and migrant households means. Even though these t-tests fail to control for a number of potentially important influencing factors, they provide a preliminary clue as to the differences between migrant and non-migrant households.

For family characteristics, we see that migrant households have larger households, more senior citizens, and are more likely to be female headed. Interestingly, we do not observe a difference in the education levels or number of children in the household between these two groups. It is not surprising that migrant households are larger and have more senior citizens, given that these households are more likely to be able to withstand a loss of family labor and migrants are typically at the beginning of their working lives, leaving the older generation behind. Migrant households also have significantly lower dependency ratios, which is somewhat contrary to expectations, given it is generally the working age family members who migrate.

We see that remittances received, in migrant households average approximately $US 902.00 per year. However, not all migrant household receive remittances, and if you condition the mean of remittances on actually receiving remittances, this figure increases to $US 1319.00 per year.

In terms of agricultural production migrant households apparently engage in livestock production more readily than non-migrant households. Migrant households exhibit a higher value of their livestock as well as higher value of animal products derived from this livestock. Interestingly, these two groups do not differ in the value of crops produced.

It appears that migration may have little impact on input use at the farm level. The percentage of households that use improved seeds, inorganic fertilizer, and pesticides does not differ across migrant and non-migrant households.

Migrant and non-migrant households may differ in their land holdings and the use of these holdings. Migrant households have a higher average number of hectares, at 2.5

for migrant households, and 1.3 for non-migrant households. Migrant households also have a higher average acreage in uncultivated land, rented out land, rented in land, land dedicated to the homestead, as well as land in pasture. It seems that on average migrant households cultivate more land. The mean area dedicated to basic grains and other cash crops are significantly higher for migrant households, but the mean hectares dedicated to coffee production do not vary significantly by migration status.

Results

Empirical results suggest that remittances do have an impact on the agricultural production structure and land use patterns at the household level. All of the following results report the impact of remittances on the dependent variable after household demographics and asset levels are controlled for, including number of household senior citizens, female headed household, years of education of the household head, age of the household head, number of household members, number of household children, the dependency ratio (dependents / working-age adults), and off-farm wage reported by the household. Land area and livestock values are included to control for asset levels in lieu of including income in the regression, but these two asset variables are also used as dependent variables and explained using the same demographic and instrumental variables.

Results in tables 5 and 6 suggest firstly that remittance-receiving households have significantly more land area in hectares, as well as significantly higher livestock values. To account for the potential reverse causality in these relationships (it is highly likely that livestock and land values would determine the probability of migration to begin with),

remittances are instrumented using the instruments discussed above. According to estimates using a household random effects model, for every $1,000 in remittances, livestock value increases by $392 and the land assets of a household increase by .577 hectares.

It appears that migration and remittances has very little effect on land rental markets as seen in table 7. While results were insignificant for both land rented in and rented out. Signs on these variables are positive for land rented in, and negative for land rented out. However, given that land area is significantly higher for households with remittances, the rental results suggest that the differential in land area is being acquired either through purchase, or some other form of land acquisition, not through land rental markets.

Examining the land use of households in table 8 suggests that increases in land and the impact of remittances are directed to two areas. First, households that receive remittances have increased hectares dedicated to the housing area. This is consistent with conventional thinking that a large portion of remittances is dedicated to home improvement. Second, an increase in remittances increases the land area dedicated to crop cultivation. Lastly, there is weak evidence that receiving remittances also increases the fallow area on a farm, however this result is only significant at the 10% level. There is no significant difference between households that receive remittances and those that do not in terms of land in forestry, pasture, or unoccupied land. Table 9 shows what crops are being produced on the cultivated land. We expected to see an increase in remittances leading to increased cultivation of cash crops, such as coffee, vegetables, or other cash crops. However, results suggest that receiving remittances actually increases the

cultivation of basic grains (corn, beans, millet, and sorghum). This result suggests that remittances and migration may not be decreasing risk to enable households to move into the cultivation of cash crops, but rather facilitating the movement toward a livestock and basic grains based production system.

The value of animal products and crops produced, seen in Table 10, further confirms this trend. There is weak evidence that the value of animal products, such as milk, eggs, etc. increases with an increase in remittances, which is consistent with the finding of an increase in livestock value. But there is no significant change in the crop value of production, which, given the increase in acreage dedicated to basic grains may either indicate a decrease in yields, or production intensity, or a move out of cash crops acreage and a rededication of that acreage to basic grains.

Conclusions

In this paper we examine the impact of international migration and remittances on agricultural production and agricultural asset holdings in El Salvador. We find that, after controlling for the endogeneity of remittances using an instrumental variable approach, and incorporating household random effects to account for unobserved household effects, households that have migrants and receive remittances engage differently in agricultural production than those who do not have migrants. Migrant households have larger land holdings, that are dedicated to the homestead area and basic grains and other cash crop cultivation. They also have higher livestock values and value of livestock products.

Migration is inarguably changing the social landscape of rural El Salvador. However, in this paper we see evidence that it is also changing the rural productive landscape as well.

References

Amano, Masanori. (1983) "On the Harris-Todaro Model with Inter-sectoral Migration of Labor" *Economica*, 50: 311-323.

Adams Jr., Richard H. (1998) "Remittances, Investment, and Rural Asset Accumulation in Pakistan." *Economic Development and Cultural Change*, Vol. 47, No. 1, pp 155 – 173.

Bardhan, Pranab, and Christopher Urdy. (1999) "Development Economics" *Oxford University Press*: New York.

Bhagwati, J. and Srinivasan, T.N. (1974) "On reanalyzing the Harris-Todaro model: policy ranking in the case of sector specific sticky wages". *American Economic Review*, 64, 502-508.

Calvo, G. A. (1978) "Urban unemployment and wage determination in LDCs: trade unions in the Harris Todaro Model". *International Economic Review*, 19, 65-81.

Conning, Johnathan, Pedro Olinto, Alvaro Trigueros. (2001) "Managing Economic Insecurity in Rural El Salvador: The role of asset ownership and labor market adjustments" *Basis Publication*, May. http://www.ies.wisc.edu/ltc

Corden, W. M. (1974) "Trade Policy and Economic Welfare", *Oxford*: Clarendon Press.

Direccion General de Estadistica y Censos. (2006) http://www.digestyc.gob.sv/.

Harris, John R. and Michael Todaro. (1970) "Migration, Unemployment and Development: A Two-Sector Analysis". *American Economic Review*, vol. 60.

McCarthy, Nancy, Gero Carletto, Benjamin Davis, and Irini Maltsoglou. (2007) "Assessing the Impact of Massive Out-Migration on Agriculture." *ESA Working Paper* No. 06-14.

Miluka, Juna, Gero Carletto, Benjamin Davis, and Alberto Zezza. (2007). "The Vanishing Farms? The Impact of International Migration on Albanian Family Farming." *103rd EAAE Seminar Paper*. Barcelona, Spain.

Neary, Peter. (1981) "On the Harris-Todaro Model with Intersectoral Capital Mobility." *Econometrica*. 48, 219-234.

Pleitez Chavez, Rafael Antonio. (2004) "Remittances as a Strategy to Cope with Systemic Risk: Panel Results from Rural Households in El Salvador" *Dissertation*, Ohio State University.

Rozelle, Scott, J. Edward Taylor, and Alan deBraw. (1999) "Migration, Remittances, and Agricultural Productivity in China." *American Economics Review*, Vol 89, no 2.

Stark, Oded, and David E. Bloom. (1985) "The New Economics of Labor Migration". *American Economic Review*, vol. 75, no 2: May.

Stark, Oded. (1984) "Rural to Urban Migration in LDCs: A Relative Deprivation Approach." *Economic Development and Cultural Change*, Vol 32, No.3, April.

Stark, Oded. (1991) "The Migration of Labor." *Cambridge, MA*: Blackwell.

Stark, Oded and J. Edward Taylor. (1991) "Migration Incentives, Migration Types: The Role of Relative Deprivation." *The Economic Journal*, Vol 101, No 408, Sept.

Stark, Oded and J. Edward Taylor. (1989) "Relative deprivation and international migration". *Demography*, vol 26 (I), 1-15.

Stiglitz, J.E. (1975) "Alternative theories of wage determination and unemployment in LDCs: the labour turnover model". *Quarterly Journal of Economics*, 88, 194 – 227.

Taylor, Edward J. and T.J. Wyatt. (1996) "The shadow value of migrant remittances, income and inequality in the household-farm economy". *The Journal of Development Studies*. 32(6). 899-912.

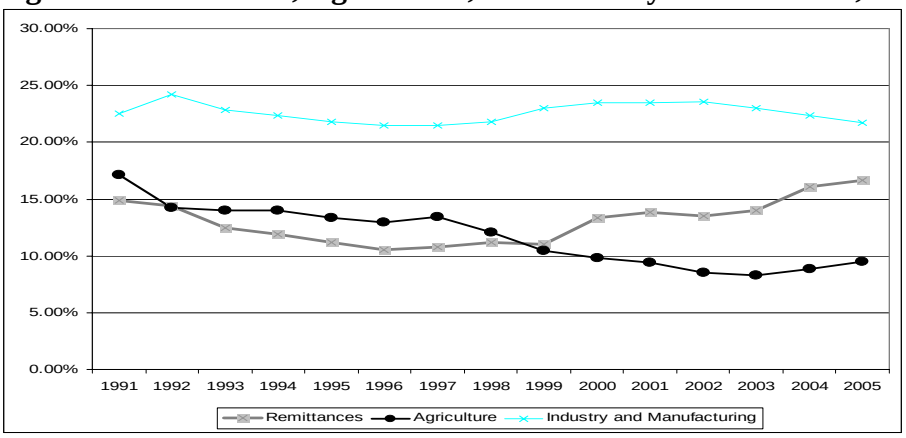
Vargas, Alberto. (2003) "El Salvador Country Brief: Property Rights and Land Markets" *Land Tenure Center*, University of Wisconsin-Madison.

Table 1. Remittances Received in El Salvador, 1991 – 2005

Year	TOTAL Remittances (millions)	Percentage Change	Remittances as a % of GDP
1991	790.10		14.9%
1992	858.30	8.6%	14.4%
1993	864.10	0.7%	12.5%
1994	962.50	11.4%	11.9%
1995	1,061.40	10.3%	11.2%
1996	1,086.50	2.4%	10.5%
1997	1,199.50	10.4%	10.8%
1998	1,338.30	11.6%	11.1%
1999	1,373.80	2.7%	11.0%
2000	1,750.70	27.4%	13.3%
2001	1,910.50	9.1%	13.8%
2002	1,935.20	1.3%	13.5%
2003	2,105.30	8.8%	14.0%
2004	2,547.60	21.0%	16.1%
2005	2,830.20	11.1%	16.7%
2006	3135.70	10.8%	20.7%

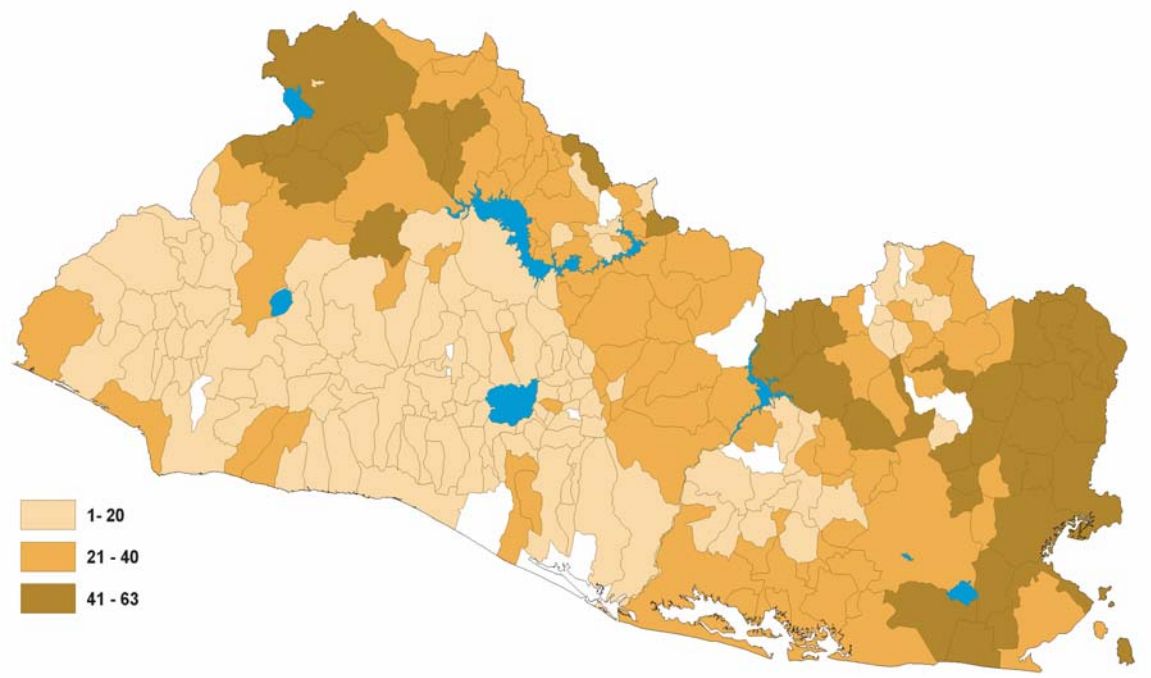
Source: *Banco Central de Reserva de El Salvador*, (Central Reserve Bank of El Salvador), 2006

Figure 1. Remittance, Agriculture, and Industry share of GDP, 1991 – 2005



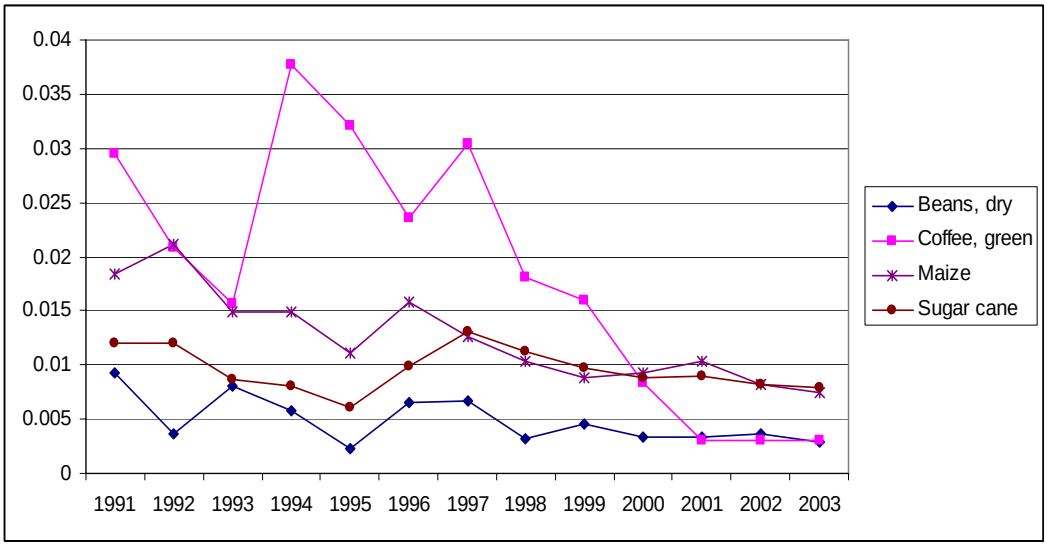
Source: *Banco Central de Reserva de El Salvador*, (Central Reserve Bank of El Salvador), 2006

Figure 2. Percent of Households that Receive Remittances by Municipality, 2004



Source: EHPM 2001 – 2004, Chapter 5 UNDP Human Development Report El Salvador

Figure 3. GDP Shares of Crop Values, 1991 – 2003.



Source: FAOSTAT FAO Statistics Division 2007 and *Banco Central de Reserva de El Salvador*, (Central Reserve Bank of El Salvador), 2006.

Figure 4. Percent of Employment in Agriculture, 1994 – 2004.

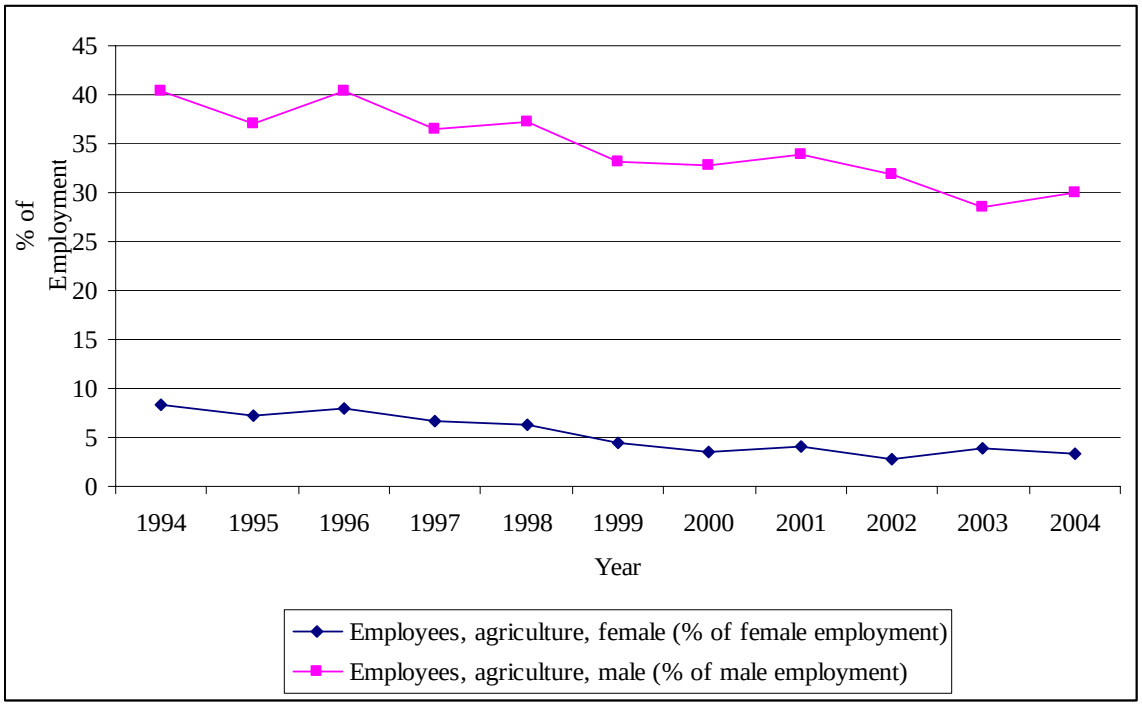


Table 2. Description of Variables used in Empirical Analysis

Dependent Variables	
Value of Animal Products	Quantity of animal products produced multiplied by the market price of the product reported by the household
Crop Value	Quantity of crop products produced multiplied by the market price of the product reported by the household
House Area	Area in hectares dedicated to the household's house and immediate living area
Forest Area	Area in hectares dedicated to forest
Pasture Area	Area in hectares dedicated to pasture
Fallow Area	Area in hectares dedicated to being fallow.
Unoccupied Area	Area in hectares that is unoccupied
Cultivated Area	Area in hectares that is cultivated with any crop except pasture.
Basic Grains Area	Area in hectares dedicated to the production of basic grains
Coffee Area	Area in hectares dedicated to coffee production
Other Cash Crops Area	Area in hectares dedicated to other cash crops
Ha Rended In	Area in hectares rented in.
Ha Rented Out	Area in hectares rented out.
Livestock Value	Market value of all livestock owned by the household
Land Area	Area in hectares that the family possesses, includes net rented in land, and land acquired through land transfer programs.
Independent Variables.	
remesas	Level of remittances received by the household
landarea	Area in hectares that the family possesses, includes net rented in land, and land acquired through land transfer programs.
hhsencit	Number of senior citizens in the household
femhead	Dummy variable equals 1 if the household is headed by a female
eduhead	Number of years of schooling obtained by the household head
agehead	Age of the household head
hh_member	Number of household members
hhchild	Number of children in the household
livestockvalue	Market value of all livestock owned by the household
depratio	Number of dependents divided by number of people between 16 and 65 years of age.
wage	The off-farm wage reported by the household

Table 3. Attrition Probit

Variable	Total Sample	1996 - 1998	1998 - 2000	2000-2002
Household Size 1996	0.212 ***	0.186 ***	-0.114	-0.364 **
Standard Error	*0.042*	*0.043*	*0.094*	*0.154*
Migrant Household 1996	-0.151	-0.172	-0.017	-0.216
Standard Error	*0.095*	*0.098*	*0.217*	*0.317*
Senior Citizen in Household 1996	-0.055	-0.024	0.088	0.344
Standard Error	*0.110*	*0.114*	*0.254*	*0.364*
Child in Household 1996	-0.159 ***	-0.132	0.075	0.374
Standard Error	*0.068*	*0.070*	*0.156*	*0.255*
Received Remittances 1996	0.000	0.000	0.000	0.000
Standard Error	*0.000*	*0.000*	*0.000*	*0.000*
Hours of on-farm work 1996	0.000	0.000	0.000	0.000
Standard Error	*0.000*	*0.000*	*0.000*	*0.000*
Hours of off-farm work 1996	0.000	0.000	0.000	0.000
Standard Error	*0.000*	*0.000*	*0.000*	*0.000*
Dependency Ratio 1996	0.152	0.143	0.078	-0.396
Standard Error	*0.095*	*0.097*	*0.238*	*0.339*
Livestock value 1996	0.000	0.000	0.000	0.000
Standard Error	*0.000*	*0.000*	*0.000*	*0.000*
Land Area 1996 (Hectares)	-0.013	-0.018	-0.015	-0.042
Standard Error	*0.010*	*0.010*	*0.033*	*0.066*
Female headed household 1996	-0.072	0.095	-0.341	1.147 ***
Standard Error	*0.185*	*0.192*	*0.554*	*0.379*
Santa Ana	-0.013	-0.136	-0.279	-0.596
Standard Error	*0.234*	*0.241*	*0.450*	*0.542*
Sonsonate	-0.263	-0.260	0.387	
Standard Error	*0.244*	*0.252*	*0.407*	
Chalatenango	0.211	0.331	0.258	-0.639
Standard Error	*0.286*	*0.309*	*0.459*	*0.687*
La Libertad	-0.035	-0.328		
Standard Error	*0.230*	*0.236*		
San Salvador	0.195	0.115	-0.350	-0.404
Standard Error	*0.252*	*0.265*	*0.471*	*0.548*
Cuscatlan	-0.575 **	-0.647 **	-0.042	-0.148
Standard Error	*0.291*	*0.293*	*0.600*	*0.703*
La Paz	-0.322	-0.520		-0.833
Standard Error	*0.271*	*0.277*		*0.775*
Cabanas	-0.410	-0.336	0.315	0.463
Standard Error	*0.287*	*0.294*	*0.501*	*0.565*
San Vicente	-0.167	-0.282		0.115
Standard Error	*0.320*	*0.327*		*0.647*
Usulutan	0.084	-0.161		
Standard Error	*0.249*	*0.254*		
San Miguel	-0.007	-0.025	0.073	-0.498
Standard Error	*0.237*	*0.246*	*0.421*	*0.552*
Morazan	-0.021	-0.133		0.032
Standard Error	*0.275*	*0.283*		*0.548*
La Union	-0.207	-0.262	-0.386	-0.019
Standard Error	*0.240*	*0.247*	*0.539*	*0.514*
Constant	-0.706	-0.383	-1.211	0.345

Standard Error	*0.243*	*0.250*	*0.510*	*0.689*
Panel Households	451	494	470	451
Attritors	287	244	24	19
Total Households	738	738	494	470

Dependent Variable: 1= observed in all 4 survey years, 0 = not observed in all 4 survey years

*** significant at the 1% level

** significant at the 5% level

Source: Calculated by the author using OSU BASIS data

Table 4. Descriptive Statistics and Means Comparison

	Mean					
Variable	**Total Sample**	**Non-Migrant Household**	**Migrant Household**	**Difference**	**t-test different than zero (p-value)**	
Demographic Variables						
Household Size	7.406	6.793	8.419	-1.627	0.000	***
standard error	0.074	0.080	0.138	0.149		
sample size	1796	1119	677			
Number of Senior Citizens	0.537	0.319	0.897	-0.578	0.000	***
standard error	0.028	0.025	0.058	0.056		
sample size	1796	1119	677			
Number of Children in Household	2.633	2.693	2.533	0.160	0.152	
standard error	0.054	0.064	0.098	0.112		
sample size	1796	1119	677			
Female Headed Households	0.125	0.097	0.171	-0.075	0.000	***
standard error	0.008	0.009	0.014	0.016		
sample size	1796	1119	677			
Years of Education for Family Head	2.702	2.763	2.602	0.161	0.214	
standard error	0.063	0.080	0.101	0.130		
sample size	1581	990	591			
Dependency Ratio (dependents/ working age adults)	0.976	1.037	0.878	0.159	0.000	***
standard error	0.022	0.028	0.033	0.044		
sample size	1770	1096	674			
Remittances	340.305	0.000	902.787	-902.787	0.000	***
standard error	24.555	0.000	59.127	45.982		
sample size	1796	1119	677			
Agricultural Value and Inputs						
Value of Livestock	933.786	589.264	1501.205	-911.941	0.002	***
standard error	144.503	117.334	329.100	297.349		
sample size	1792	1115	677			
Value of Animal Products Produced (milk, eggs, etc)	264.893	182.262	401.633	-219.372	0.000	***
standard error	29.849	25.952	66.297	61.400		
sample size	724	398	326			
Value of Crops Produced	702.273	727.415	660.805	66.611	0.789	
standard error	120.584	177.000	129.900	248.821		
sample size	971	565	406			
Use of Improved Seeds	0.710	0.689	0.741	-0.052	0.684	
standard error	0.063	0.072	0.113	0.128		
sample size	1796	1119	677			
Use of Inorganic Fertilizer	0.335	0.347	0.317	0.030	0.286	
standard error	0.014	0.018	0.022	0.028		
sample size	977	570	407			
Use of Pesticides	0.776	0.774	0.779	-0.005	0.827	
standard error	0.012	0.016	0.019	0.025		

sample size	977	570	407			
Land Holdings and Land Use						
Land Area in Hectares	1.800	1.344	2.541	-1.197	0.000	***
standard error	0.105	0.112	0.202	0.214		
sample size	1446	876	570			
Fallow Area (in Hectares)	0.141	0.081	0.232	-0.151	0.021	**
standard error	0.032	0.016	0.077	0.065		
sample size	1446	876	570			
Uncultivated Land (in Hectares)	0.144	0.091	0.230	-0.139	0.010	**
standard error	0.026	0.022	0.058	0.054		
sample size	417	240	177			
Rented Out Land (in ha)	0.118	0.030	0.260	-0.230	0.000	***
standard error	0.023	0.009	0.059	0.048		
sample size	1279	777	502			
Rented In Land (in ha)	0.256	0.213	0.327	-0.114	0.015	**
standard error	0.023	0.022	0.048	0.047		
sample size	1728	1070	658			
Homestead Land (in ha)	0.077	0.067	0.092	-0.026	0.002	***
standard error	0.004	0.005	0.007	0.008		
sample size	1279	777	502			
Land in Forest (in ha)	0.080	0.055	0.120	-0.065	0.018	**
standard error	0.013	0.017	0.022	0.027		
sample size	1279	777	502			
Land in Pasture (in ha)	0.454	0.305	0.697	-0.392	0.001	***
standard error	0.058	0.066	0.106	0.119		
sample size	1279	777	502			
Land Cultivated (in ha)	0.699	0.605	0.851	-0.246	0.000	***
standard error	0.030	0.033	0.057	0.062		
sample size	1446	876	570			
Use of Cultivated Area						
Area in Basic Grains	0.331	0.285	0.404	-0.119	0.000	***
standard error	0.015	0.017	0.029	0.031		
sample size	1279	777	502			
Area in Coffee	0.052	0.044	0.066	-0.023	0.163	
standard error	0.008	0.008	0.016	0.016		
sample size	1279	777	502			
Area in other cash crops	0.259	0.229	0.309	-0.080	0.071	*
standard error	0.022	0.024	0.041	0.045		
sample size	1279	777	502			

Table 5. Livestock Value

	Livestock Value	
	OLS	IV RE
Remittances	301.095	392.646
	(35.246)***	(51.856)***
Land Area (ha)	-65.594	-105.841
	(169.14)	(407.55)
Number of Senior Citizens	157.824	281.658
	(463.69)	(636.57)
Female Headed Household	195.589	338.299
	(60.296)***	(87.986)***
Years of Education of the Head	14.708	18.64
	(11.73)	(17.56)
Age of the HH Head	-150.286	-189.234
	(90.337)*	(134.41)
Number of HH members	213.738	295.032
	(146.94)	(227.90)
Number of HH children	-188.318	-257.433
	(279.63)	(480.84)
Dependency Ratio	-3.527	-34.121
	(54.80)	(82.64)
Wage	382.631	147.255
	(144.048)***	(428.32)
Constant	-314.629	-622.318
	(834.14)	(1218.93)
Observations	1692	1250
R-squared	0.06	
Davidson-MacKinnon Test	0.89	
Overid	0.07	

Table 6. Land Area

	Land Area in ha	
	OLS	IV RE
Remittances	0.171	0.577
	(0.098)*	(0.248)**
Number of Senior Citizens	0.052	-0.146
	(0.12)	(0.21)
Female Headed Household	-0.636	-0.867
	(0.314)**	(0.373)**
Years of Education of the Head	-0.029	-0.034
	(0.04)	(0.04)
Age of the HH Head	0.037	0.029
	(0.008)***	(0.011)***
Number of HH members	-0.079	0.036
	(0.06)	(0.07)
Number of HH children	0.119	-0.12
	(0.10)	(0.11)
Value of Livestock	0	0
	(0.000)***	(0.000)***
Dependency Ratio	-0.275	0.095
	(0.19)	(0.22)
Wage	0.131	0.124
	(0.037)***	(0.039)***
Constant	-0.298	-0.383
	(0.57)	(0.71)
Observations	1692	1250
R-squared	0.08	
Number of bole96	1692	448
Davidson-MacKinnon Test	0.08	0.89
Overid		0.07

Table 7. Rental Activity

	Land Rented In		Land Rented Out	
	OLS	IV RE	OLS	IV RE
Remittances	0.015	0.076	-0.014	-0.084
	(0.02)	(0.06)	(0.02)	(0.06)
Land Area (ha)	0.051	0.049	0.098	0.139
	(0.005)***	(0.008)***	(0.005)***	(0.008)***
Number of Senior Citizens	-0.053	-0.099	0.005	0.053
	(0.025)**	(0.06)	(0.02)	(0.07)
Female Headed Household	-0.155	-0.112	0.11	0.187
	(0.069)**	(0.11)	(0.07)	(0.107)*
Years of Education of the Head	0.009	0.022	-0.006	-0.017
	(0.01)	(0.011)*	(0.01)	(0.01)
Age of the HH Head	0.001	0.003	0.001	0
	(0.00)	(0.00)	(0.00)	(0.00)
Number of HH members	0.026	0.051	-0.02	-0.038
	(0.013)**	(0.022)**	(0.01)	(0.02)
Number of HH children	-0.01	-0.045	0.022	0.093
	(0.02)	(0.04)	(0.02)	(0.045)**
Value of Livestock	0	0	0	0
	(0.000)***	(0.000)***	0.00	0.00
Dependency Ratio	-0.007	-0.006	-0.001	-0.122
	(0.04)	(0.07)	(0.04)	(0.09)
Wage	-0.014	-0.009	0.006	0.021
	(0.008)*	(0.01)	(0.01)	(0.012)*
Constant	0.023	-0.182	-0.068	-0.054
	(0.12)	(0.22)	(0.12)	(0.20)
Observations	1692	960	1692	960
R-squared	0.1		0.19	
Number of bole96		344		344
Davidson-MacKinnon Test		0.32		0.61
Overid		0.36		0.35

Table 8. Land Use Area

	Homestead Area		Forestry Area		Pasture Area		Fallow Area		Unoccupied Area		Cultivated Area	
	OLS	IV RE	OLS	IV RE	OLS	IV RE	OLS	IV RE	OLS	IV RE	OLS	IV RE
Remittances	0.015	0.027	0.006	0.037	-0.024	-0.138	-0.002	0.042	-0.027	-0.017	0.066	0.118
	(0.003)***	(0.009)***	(0.01)	(0.02)	(0.04)	(0.09)	(0.03)	(0.025)*	(0.02)	(0.05)	(0.025)***	(0.065)*
Land Area (ha)	0.006	0.006	0.046	0.051	0.444	0.517	0.103	0.025	0.098	0.058	0.135	0.11
	(0.001)***	(0.001)***	(0.002)***	(0.003)***	(0.009)***	(0.012)***	(0.007)***	(0.003)***	(0.005)***	(0.006)***	(0.006)***	(0.009)***
Number of Senior Citizens	0.004	-0.004	0	-0.012	-0.04	0.087	0.088	-0.039	0.051	0.036	-0.024	-0.135
	(0.01)	(0.01)	(0.01)	(0.03)	(0.04)	(0.10)	(0.038)**	(0.03)	(0.025)**	(0.05)	(0.03)	(0.067)**
Female Headed Household	-0.001	-0.007	0.025	0.005	0.213	0.31	-0.012	-0.046	0.075	0.057	-0.476	-0.539
	(0.01)	(0.02)	(0.03)	(0.04)	(0.113)*	(0.161)*	(0.09)	(0.05)	(0.07)	(0.08)	(0.081)***	(0.119)***
Years of Education of the Head	0.001	0.001	0.003	0.006	-0.004	-0.007	0.005	-0.007	0.007	0.006	0.014	0.006
	(0.00)	(0.00)	(0.00)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age of the HH Head	0.001	0	0	0.001	-0.008	-0.007	-0.001	0.002	0.001	0.001	0.007	0.006
	0.00	0.00	(0.00)	(0.00)	(0.003)***	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.002)***	(0.003)*
Number of HH members	0.004	0.008	0	0.013	-0.013	-0.02	0.009	0.01	-0.019	-0.03	0.048	0.075
	(0.002)*	(0.004)**	(0.01)	(0.01)	(0.02)	(0.04)	(0.02)	(0.01)	(0.01)	(0.02)	(0.016)***	(0.024)***
Number of HH children	-0.002	-0.01	0.005	-0.016	0.004	0.019	-0.031	-0.017	0.007	0.029	-0.053	-0.115
	(0.00)	(0.01)	(0.01)	(0.02)	(0.04)	(0.07)	(0.03)	(0.02)	(0.02)	(0.04)	(0.026)**	(0.043)***
Value of Livestock	0	0	0	0	0	0	0	0	0	0	0	0
	0.00	0.00	(0.000)**	(0.000)***	0.00	0.00	(0.000)***	(0.000)*	0.00	(0.000)*	(0.000)***	(0.000)*
Dependency Ratio	-0.011	0.005	-0.018	0.022	-0.021	0.016	0.09	0.013	0.017	-0.043	0.051	0.099
	(0.01)	(0.01)	(0.02)	(0.04)	(0.07)	(0.13)	(0.06)	(0.04)	(0.04)	(0.07)	(0.05)	(0.08)
Wage	-0.001	-0.001	0	-0.003	0.015	0.016	-0.013	-0.008	-0.011	-0.007	-0.016	-0.003
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.010)*	(0.01)
Constant	0.02	0.007	-0.033	-0.114	0.068	-0.067	-0.071	-0.033	0.025	0.126	-0.031	-0.031
	(0.02)	(0.03)	(0.06)	(0.08)	(0.20)	(0.30)	(0.17)	(0.08)	(0.12)	(0.15)	(0.15)	(0.22)
Observations	1250	960	1692	960	1692	960	1413	960	1692	960	1692	960
R-squared	0.07		0.18		0.62		0.16		0.19		0.28	
Number of bole96		344		344		344		344		344		344
Davidson-MacKinnon Test		0.04		0.14		0.93		0.06		0.05		0.12
Overid		0.72		0.54		0.73		0.4		0.66		0.97

Table 10. Cultivated Land Use

	Basic Grains Area		Coffee Area		Other Cash Crops Area	
	OLS	IV RE	OLS	IV RE	OLS	IV RE
Remittances	0.058	0.153	0.003	0.004	0.005	-0.046
	(0.014)***	(0.038)***	(0.01)	(0.02)	(0.02)	(0.06)
Land Area (ha)	0.043	0.032	0.005	0.006	0.074	0.082
	(0.003)***	(0.005)***	(0.002)**	(0.003)**	(0.005)***	(0.008)***
Number of Senior Citizens	0.003	-0.061	0.009	0.036	-0.055	-0.124
	(0.02)	(0.04)	(0.01)	(0.02)	(0.023)**	(0.063)**
Female Headed Household	-0.239	-0.29	-0.021	-0.042	-0.183	-0.22
	(0.045)***	(0.067)***	(0.03)	(0.04)	(0.064)***	(0.110)**
Education HH Head (Years)	-0.019	-0.009	0.008	-0.003	0.023	0.017
	(0.006)***	(0.01)	(0.003)**	(0.00)	(0.008)***	(0.01)
Age of the HH Head	0.001	0	0.003	0.002	0.003	0.002
	(0.00)	(0.00)	(0.001)***	(0.001)*	(0.002)**	(0.00)
Number of HH members	0.018	0.054	-0.003	-0.008	0.022	0.022
	(0.009)**	(0.015)***	(0.01)	(0.01)	(0.012)*	(0.02)
Number of HH children	0.005	-0.063	-0.01	0	-0.034	-0.047
	(0.01)	(0.028)**	(0.01)	(0.02)	(0.020)*	(0.04)
Value of Livestock	0	0	0	0	0	0
	(0.000)***	(0.000)***	0.00	0.00	(0.000)***	0.00
Dependency Ratio	-0.022	0.066	0.015	0.004	0.024	0.042
	(0.03)	(0.05)	(0.02)	(0.03)	(0.04)	(0.08)
Wage	-0.002	-0.011	0	0.001	-0.015	-0.004
	(0.01)	(0.01)	(0.00)	(0.00)	(0.008)**	(0.01)
Constant	0.161	0.084	-0.085	-0.033	-0.064	0.063
	(0.080)**	(0.13)	(0.045)*	(0.08)	(0.11)	(0.20)
Observations	1692	960	1692	960	1692	960
R-squared	0.16		0.03		0.15	
Number of Households		344		344		344
Davidson-MacKinnon Test		0.48		0.14		0.48
Overid		0.58		0.86		0.94

Table 9. Value of Agricultural Products

	Crop Value		Value of Animal Products	
	OLS	IV RE	OLS	IV RE
Remittances	-39.304	-188.081	64.578	79.004
	(75.08)	(255.50)	(28.273)**	(95.04)
Land Area (ha)	96.764	127.743	96.633	155.733
	(18.723)***	(34.216)***	(7.054)***	(12.705)***
Number of Senior Citizens	-103.594	-255.311	8.954	210.663
	(88.11)	(289.00)	(33.13)	(102.617)**
Female Headed Household	-497.637	-596.291	-14.454	-72.624
	(242.205)**	(459.45)	(90.83)	(171.39)
Years of Education of the Head	57.183	85.855	-1.87	-7.779
	(31.473)*	(60.11)	(11.85)	(21.18)
Age of the HH Head	3.46	-2.218	0.649	-6.743
	(6.10)	(12.58)	(2.30)	(4.70)
Number of HH members	15.731	27.321	-9.407	11.726
	(47.15)	(104.01)	(17.71)	(37.44)
Number of HH children	-54.59	-126.71	0.016	-31.753
	(76.70)	(196.78)	(28.81)	(69.50)
Value of Livestock	0.015	0.018	0.025	0.014
	(0.01)	(0.02)	(0.005)***	(0.007)**
Dependency Ratio	30.567	136.53	-70.524	-90.038
	(145.86)	(370.17)	(54.78)	(129.59)
Wage	-16.796	-29.182	-1.577	-5.949
	(28.50)	(52.53)	(10.73)	(18.78)
Constant	344.845	864.324	166.429	483.806
	(434.23)	(856.92)	(163.50)	(319.92)
Observations	1686	955	1688	956
R-squared	0.03		0.15	
Number of bole96		344		344
Davidson-MacKinnon Test		0.77		0.1
Overid		0.16		0.6

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%